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Abstract

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Keywords

Human anatomy, occupational therapy education, curriculum

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Exploring Anatomy Coursework and Perceptions of Occupational Therapy Students: A Survey Study

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ABSTRACT

Occupational therapy practitioners utilize their knowledge of human anatomy to understand underlying anatomical dysfunction and how it impacts occupational performance. However, anatomy is not a required standalone course within occupational therapy curricula. This may leave students at a disadvantage throughout occupational therapy programs, fieldwork, and as practitioners. The primary purpose of this study was to explore graduate level occupational therapy students' previous anatomy undergraduate coursework, student perceived preparedness of anatomical knowledge, and their performance in a mandatory Analysis of Human Movement course within our university's occupational therapy graduate programs. The secondary purpose was to determine student interest in a standalone online anatomy review course if one were offered at the start of program matriculation. Participants (n=87) completed a 14-item survey regarding demographics, prior anatomy coursework, perceived preparedness, and academic performance in a mandatory Analysis of Human Movement course. Descriptive statistics and a Pearson's correlation were conducted. Data analysis revealed statistically significant correlations among several variables including perceived preparedness, and whether students felt they would have benefited from and participated in an online anatomy review course. No statistically significant correlations were found between academic performance and any other variable. Data analysis also revealed that regardless of prior anatomy coursework, perceived preparedness, and academic performance almost all participants (n=80; 92%) indicated that they would have benefited from and participated in an online anatomy review course. Though continued research is warranted, occupational therapy programs may consider the implementation of a standalone anatomy course to promote students' academic and clinical success.

Introduction

Anatomy involves the identification and study of structures and their spatial interrelationships within the human body (Yammine & Violato, 2014). Anatomical knowledge is considered foundational for safe and competent clinical practice in medical and allied health professions including occupational therapy (Barillas, 2019; Bergman et al., 2011; Dayal et al., 2017; Estai & Bunt, 2016; Schofield, 2017; Sugand et al., 2010; Turney, 2007; Waseem et al., 2018; Yammine & Violato, 2014). Though anatomical knowledge is considered crucial for medical and allied health professional students, there has been a significant decrease in curriculum hours for anatomy courses in these professions over the last several years (Díaz-Mancha et al., 2016; Drake et al., 2009; Lazarus et al., 2012; Yammine, 2014). The decreased hours devoted to anatomy education within allied health and medical curricula may affect student competency in clinical practice. Much of the literature focuses on anatomy education within medical school curricula but the literature is lacking regarding anatomy education within allied health professions, specifically occupational therapy (Carroll & Lawson, 2014; Latman & Lanier, 2001; Schofield, 2017).

In the field of occupational therapy, practitioners utilize occupations as treatment interventions and as the final treatment outcome (American Occupational Therapy Association [AOTA], 2014). An occupation can be defined as a meaningful daily activity that enables participation in roles, habits, and routines in any setting (AOTA, 2014). Occupations are the primary focus of the profession (AOTA, 2014) and occupations cannot be addressed without understanding and applying anatomical knowledge. Occupational therapy practitioners use their knowledge of anatomy in their analysis of occupational performance. This anatomical knowledge allows occupational therapy practitioners the ability to better understand the limitations in occupations when examining other factors such as age, illness, disease, and deficits and how they influence occupational performance (Carroll & Lawson, 2014; Schofield, 2017).

The understanding of anatomical dysfunction and its application to occupations aids practitioners in performing evaluations and providing best practice interventions (Schofield, 2017). On the contrary, a lack of anatomical knowledge may lead to unsafe medical and therapeutic interventions and consequently may put patients at risk for further injury (Ellis, 2002; Yammine, 2014; Yammine & Violato, 2014) and occupational dysfunction. Thus, a strong understanding of anatomical knowledge is necessary for safe and competent clinical practice in the field of occupational therapy. With anatomical knowledge serving as the foundation for safe and competent clinical practice, anatomy should be considered a vital and integral part of occupational therapy curricula (Schofield, 2017).

Minimum standards for anatomy coursework were created by the AOTA in 1923 and have been incorporated into occupational therapy curricula ever since (AOTA, 1924, as cited in Carroll & Lawson, 2014). In 1923, anatomy was one of the required biological science courses for students in occupational therapy programs (Carroll & Lawson, 2014). AOTA created these standards with the belief that a thorough understanding of anatomical knowledge would improve occupational therapists' delivery of therapeutic

interventions (Carroll & Lawson, 2014). Though this belief may remain, the standards for anatomy within occupational therapy curricula are currently loosely defined and the application of the standards is highly variable in occupational therapy programs.

As the field of occupational therapy has expanded and the number of occupational therapy programs has increased over the past several decades, changes in curriculum standards have occurred. In 1994, the AOTA Accreditation Committee transitioned to a national independent accrediting organization known as the Accreditation Council for Occupational Therapy Education (ACOTE; AOTA, n.d.a). ACOTE is the current accrediting body responsible for creating and enforcing educational standards for occupational therapy programs (AOTA, n.d.b). The current ACOTE standard related to anatomy for both master's level and entry-level doctorate occupational therapy curricula states that students must, "demonstrate knowledge of the structure and function of the human body to include the biological and physical sciences, neurosciences, kinesiology, and biomechanics" (ACOTE, 2018, p. 25). There are no other ACOTE standards that directly address anatomy. ACOTE also does not require anatomy to be a standalone course within occupational therapy programs (Schofield, 2013; Schofield, 2017). The vagueness within the standard may allow for freedom of curriculum structure, however, this may lead to ambiguity of course content and rigor from curriculum to curriculum (Adam et al., 2014). Sending students into the workforce with inadequate anatomical knowledge may result in unsafe and inappropriate clinical practice (Lazarus et al., 2012; Smith & Mathias, 2010; Yammine, 2014) and decreased clinical confidence as students and future practitioners. One potential reason for the lack of anatomy standards within occupational therapy education is that the specific anatomy knowledge required for safe and competent clinical practice has not been identified (Lazarus et al., 2012; Schofield 2013; Schofield, 2017). A more in-depth analysis of how anatomy is taught within occupational therapy curricula may be warranted to help ensure occupational therapy students have the foundational knowledge required for safe evidenced-based practice in clinical settings.

Students who study occupational therapy come from a wide variety of academic backgrounds. Entry-level Master of Occupational Therapy (MOT) and entry-level Occupational Therapy Doctorate (OTD) programs require applicants to complete a four-year undergraduate degree and university specific prerequisites (AOTA, n.d.c). There are no specific undergraduate degrees required prior to occupational therapy program matriculation. As a result, students may have undergraduate degrees in areas such as exercise science, psychology, humanities, public health, recreational therapy, and business management. The diversity of undergraduate degrees can bring unique backgrounds and diverse perspectives that enhance and enrich occupational therapy cohorts. However, students from backgrounds outside of the health sciences may be at a disadvantage due to a lack of exposure to courses that are pertinent to the health sciences or field of occupational therapy. Along with various undergraduate degrees, students studying occupational therapy also have varying anatomy backgrounds and experiences prior to occupational therapy program matriculation. Factors that influence student backgrounds and experiences may include the prerequisite requirements to take undergraduate anatomy courses, the curriculum structure and rigor of the

undergraduate program, and the delivery methods of lecture and laboratory content. Additionally, undergraduate anatomy prerequisite requirements for graduate programs vary among universities.

Components such as curriculum structure, delivery methods (Adam et al., 2014; Schofield, 2013) and the rigor of undergraduate anatomy courses are also not universal (Thomas et al., 2011). A recent study compared four different undergraduate anatomy programs in the United States (Sparacino et al., 2018). The results of the study indicated vast differences in the courses especially if the course had a regional approach (content focuses on body regions such as lower limb, upper limb, etc.) compared to a system-based approach (content focuses on body systems such as digestive, nervous, etc.; Sparacino et al., 2018). Differences were found among all four universities regarding total number of anatomical terms, concepts included in each curriculum, and teaching resources (Sparacino et al., 2018). Additionally, there is a lack of core national standards among universities for undergraduate anatomy courses (Moxham et al., 2014) which may contribute to variance among courses.

There is inconsistency regarding the amount of time prerequisite anatomy course credits are valid for when applying to occupational therapy programs. The ability to recall information from a prerequisite course taken five- or ten-years prior is highly unlikely especially at the graduate level. There is sparse literature on the anatomical knowledge retention of occupational therapy students. However, studies of medical and other health professional students found that over the course of several years, attrition of anatomical knowledge occurred (Dayal et al., 2017; Jurjus et al., 2014). Consistent time limitations since completion of prerequisite anatomy courses may help ensure occupational therapy students have the necessary knowledge and skills to enter graduate level programs.

Due to the lack of consistency among undergraduate anatomy courses including prerequisite requirements, curriculum content and design, time since completion of previous anatomy courses, and number of completed science and anatomy courses, students entering occupational therapy programs have not been exposed equally to anatomy content. Thus, students are entering into occupational therapy programs with differing levels of anatomy background and knowledge.

The primary purpose of this study was to explore students' previous anatomy undergraduate coursework, student perceived preparedness of anatomical knowledge, and their performance in a mandatory Analysis of Human Movement course within our university occupational therapy graduate programs. The secondary purpose was to determine student interest in a standalone online anatomy review course if one were offered at the start of the occupational therapy program matriculation.

Methods

Development of the Survey

This study used a survey design to gather data. The authors developed the survey and three of four authors had prior experience with survey research. The 14-item survey included questions regarding demographic and descriptive data from current occupational therapy students and graduates. Descriptive data included prior anatomy background, perceived preparedness for anatomy related content in a mandatory Analysis of Human Movement course, and academic performance in a mandatory Analysis of Human Movement course. Additionally, participants were asked to identify if they believe they would have benefited from and participated in an online general anatomy review course at the start of occupational therapy program matriculation. Survey questions consisted of multiple choice, select all that apply, Likert scale, and free-responses formats.

The survey was piloted among current OTD students, alumni, and physical and occupational therapy faculty. Feedback received resulted in revisions to the survey for question clarity and content. A copy of the final survey can be found in the Appendix. The university's Institutional Review Board provided ethical approval for the study.

Survey Participants and Administration

The participants for the study were recruited as a convenience sample from a small private, not-for-profit university that has two different campuses in separate states. The inclusion criteria included status as MOT or entry-level OTD alumni from either university campus, or status as a current entry-level OTD student who had passed the mandatory Analysis of Human Movement course. This course was selected because it is the primary course within our occupational therapy programs that fulfills the curricula ACOTE standards for anatomy knowledge. Participants were from both campuses.

The survey was administered through Qualtrics (Qualtrics, Provo, UT & Seattle, WA: <http://qualtrics.com>). Potential participants were contacted via email and university linked social media accounts, both included an informed consent and a direct link to the online survey. Participation in the survey was completely voluntary. Participants were informed they could elect to withdraw at any time and that submission of the survey indicated consent to participate. The email was sent out twice to increase survey participation. The survey was open for a period of six weeks.

Data Analysis

At the end of the survey data collection period, raw survey data was exported from the electronic Qualtrics site. The researchers utilized descriptive statistics and other statistical methods including a Pearson's correlation to summarize and identify correlations in the data. The magnitude for the correlations were interpreted as 0.1 to 0.3 small, 0.3 to 0.5 moderate, and 0.5 to 1.0 large (Cohen, 1988). Open ended responses were analyzed and themed. Open coding was used and like codes were clustered into categories. The codes were compared between the co-investigators. Co-investigators cross-compared and discussed the themes and revised the themes until agreement was achieved.

Results

Participants

Eighty-seven of the 420 survey recipients completed the survey (20.9% response rate). The demographics of the participants including age, gender, and undergraduate degree are presented in Table 1. The geographical locations of where participants took prerequisite anatomy courses are represented among 26 states throughout the United States (Southeast 32 (37%); Northeast 14 (16%); Midwest 33 (38%); West 5 (6%); N/A 3 (3%)).

Table 1

Demographics

Demographics	Number of Responses	Percentage
Age		
22-24	27	31%
25-27	30	35%
28-30	16	18%
31-33	6	7%
33-37	5	6%
N/A	3	3%
Total	87	100%
Gender		
Female	79	91%
Male	8	9%
Total	87	100%
Undergraduate degree		
Health sciences	51	59%
Ex: Exercise Science, allied health, kinesiology		
Science	28	32%
Ex: Biology/biological sciences, psychology		
Non-health science or non-science	2	2%
Ex: Communication disorders, education		
Health science and science (double major)	1	1%
I prefer not to answer or did not answer	5	6%
Total	87	100%

Descriptive Statistics

Anatomy Background

Participants were asked to indicate their reason for taking anatomy as a prerequisite. Fifty-five (63%) participants took anatomy as a requirement for their undergraduate degree, 19 (22%) participants took anatomy during their undergraduate degree (not required for graduation) as a graduate school prerequisite, 12 (14%) participants took anatomy as a post graduate course for a graduate school prerequisite, and two (1%) participants either selected *I prefer not to answer* or did not answer the question.

Participants were asked to identify the time elapsed from their last anatomy course to the start of program matriculation. Of the 87 participants, seven (8%) took their last anatomy course 1-3 months prior, 13 (15%) took their last course 4-6 months prior, 14 (16%) took their last course 7-12 months prior, 29 (33%) took their last course 1-2 years prior, 20 (23%) took their last course 3-4 years prior, three (3%) took their last course five or more years ago, and one (1%) preferred not to answer (see Table 2).

Table 2

Time Since Last Anatomy Course

Amount of Time	Number of Responses	Percentage
1-3 months prior	7	8%
4-6 months prior	13	15%
7-12 months prior	14	16%
1-2 years prior	29	33%
3-4 years prior	20	23%
5 or more years prior	3	4%
I prefer not to answer	1	1%
Total	87	100%

Regarding how many semesters of anatomy were taken prior to program matriculation, six (7%) participants took one semester, 48 (55%) participants took two semesters, 19 (22%) participants took three semesters, 11 (13%) participants took four semesters, one (1%) participant took five semesters, and two (2%) participants took six or more semesters (see Table 3). Additionally, participants were asked if their prerequisite anatomy courses were offered separately from physiology courses. Twenty-eight (32%) participants responded *yes*, 55 (63%) participants responded *no*, and four (5%) participants responded *other*.

Table 3*Number of Semesters of Anatomy Prior to Occupational Therapy Program Matriculation*

Semesters	Number of Responses	Percentage
1 semester	6	7%
2 semesters	48	55%
3 semesters	19	22%
4 semesters	11	13%
5 semesters	1	1%
6 or more semesters	2	2%
Total	87	100%

The following options were provided for participants to choose from regarding types of prior anatomy lab formats: *human cadaver lab, dissection lab, models, lecture only/ no lab component, anatomy and physiology combined lab, computer generated/web-based, other, please specify below*. The types of anatomy labs participants experienced are presented in Table 4. Survey results revealed 27 (31%) participants experienced only one type of anatomy lab format, 31 (36%) participants experienced two types of anatomy lab formats, 21 (24%) participants experienced three types of anatomy lab formats, and eight (9%) participants experienced four types of anatomy lab formats.

Perceived Preparedness and Academic Performance

Participants were asked to indicate how prepared they felt for the anatomy related content in the Analysis of Human Movement course (see Table 5). Forty-six (53%) participants felt not prepared or somewhat prepared, 20 (23%) participants felt prepared, 20 (23%) participants felt very prepared or extremely prepared, and one (1%) participant preferred not to answer.

Table 4*Types of Anatomy Labs Participants Experienced Prior to Program Matriculation*

Labs	Number of Responses	Percentage
Human cadaver lab	24	13%
Dissection lab	38	21%
Models	49	27%
Lecture only, no lab component	2	1%
Anatomy and physiology combined lab	54	29%
Computer generated/web-based	9	5%
Other, please specify	8	4%
Total	184	100%

Note. Responses exceeded the number of survey participants due to the question's select all that apply format.

Table 5*Students' Perceived Preparedness of the Anatomy Related Content in the Analysis of Human Movement Course*

Perceived Preparedness	Number of Responses	Percentage
Not prepared	5	6%
Somewhat prepared	41	47%
Prepared	20	23%
Very prepared	11	13%
Extremely prepared	9	10%
I prefer not to answer	1	1%
Total	87	100%

Content Review and Benefit of Refresher Course

Participants were asked to select all concepts that they felt would have been beneficial to review prior to the Analysis of Human Movement course. Participants could choose from the following options: *bones, muscle actions, muscle origins and insertions, synovial joints (ex. Ball and socket, saddle, hinge, pivot) skeletal muscle shapes (ex. Fusiform, unipennate, parallel etc.), other, please specify*. The results can be viewed in Table 6. The concepts participants selected the most were muscle actions and muscle origins and insertions. Answers from participants who selected other, please specify included “muscle names,” “boney landmarks,” “nerves/innervations,” “tendons,” “muscle grades,” “passive/active insufficiency,” “levers,” “planes,” and “functional movement analysis.”

Almost all participants (80; 92%) felt that they would have benefited from and participated in an online anatomy review course at the start of their graduate program. Only six (7%) participants did not feel they would have benefited from such a course and one (1%) participant preferred not to answer.

When asked to report their final grade in the Analysis of Human Movement course, 50 (57%) participants reported receiving an A (90-100), 32 (37%) participants reported receiving a B (80-89), 4 (5%) participants preferred not to respond, and one (1%) response was invalid. No participants reported receiving a C as the final grade in the Analysis of Human Movement course.

Table 6

Topics Participants Identified as Beneficial to Review Prior to the Mandatory Analysis of Human Movement Course

Concepts	Number of Responses	Percentage
Bones	45	15%
Muscle actions	71	24%
Muscles origins and insertions	79	27%
Synovial joints (ex. Ball and socket, saddle)	47	16%
Skeletal muscles (ex. Fusiform, unipennate)	37	13%
Other, please specify	13	4%
I prefer not to answer	1	1%
Total	293	100%

Note. Responses exceeded the number of survey participants due to the select all that apply question format.

Correlations

A Pearson correlation coefficient was utilized to determine the association between variables. Correlations are presented in Table 7. A statistically significant large positive correlation was found between undergraduate degree and reason for taking anatomy courses ($r=0.526$; $p<0.001$). Statistically significant small negative correlations were found between undergraduate degree and these variables: when last anatomy course was taken ($r=-0.226$; $p=0.021$); and perceived preparedness ($r=-0.201$; $p=0.035$). A statistically significant moderate negative correlation was found between undergraduate degree and the number of semesters of anatomy courses ($r=-0.369$; $p<0.001$). A statistically significant small negative correlation was found between reason for taking anatomy courses and when last anatomy course was taken ($r=-0.288$; $p=0.003$) and between when last anatomy course was taken and if anatomy was offered separately from physiology ($r=-0.219$; $p=0.021$).

The amount of anatomy prior to program matriculation had a small positive correlation with the type of anatomy lab taken ($r=0.238$; $p=0.013$); and perceived preparedness ($r=0.214$; $p=0.023$). A statistically significant moderate positive correlation was also found between if students felt they would have benefited from and participated in an online review course and perceived preparedness ($r=0.363$; $p<0.001$). A statistically significant small positive correlation was found between if students felt they would have benefited from and participated in an online review course and the reason for taking anatomy ($r=0.264$; $p=0.007$); and type of content material that was beneficial to review prior to the course ($r=0.220$; $p=0.022$). No statistically significant correlations were found between final course grade and any of the variables.

Table 7*Pearson's Correlations for Study Variables*

	1	2	3	4	5	6	7	8	9	10
Undergraduate degree	-									
Reason for taking anatomy	.526**									
Time since last anatomy course	-.226*	-.288**								
Number of semesters of anatomy	-.369**	-.125	-.078							
Separation of anatomy courses	.063	.106	-.219*	.016						
Types of anatomy labs	-.122	.040	-.192*	.238*	.185*					
Perceived preparedness	-.201*	-.170	.090	.214*	-.128	.095				
Final grade	-.061	.067	.130	.052	-.034	-.020	-.063			
Concepts beneficial to review	.179	.079	-.010	.002	-.100	-.129	.135	-.095		
. If online course would be beneficial	.034	.264**	.077	.134	-.041	.023	.363**	.017	.220*	-

Note. **Correlation is significant at the 0.01 level (1-tailed)

*Correlation is significant at the 0.05 level (1-tailed)

Discussion

The purpose of this study was to explore prior anatomy coursework, perceived preparedness, and academic performance in a mandatory Analysis of Human Movement course among occupational therapy students and graduates from the same university. In this study, 27% of students had taken anatomy three or more years prior to occupational therapy program matriculation and 33% had taken anatomy 1-2 years prior to program matriculation. Time since last anatomy course was explored in this study as anatomy knowledge retention has been a reoccurring concern in medical and health professional educations (Bains & Kaliski, 2020; Custers, 2010; Dayal et al., 2017; Doomernik et al., 2016; Jurjus et al., 2014; Narnaware & Neumeier, 2019; Parmar & Rathinam, 2011; Stabile, 2015; Waseem et al., 2018; Wilhelmsson et al., 2009; Zumwalt et al., 2010).

A study by Jurjus et al. (2014) found that medical students in general surgery rotations demonstrated a 35.4% decrease in overall retention of anatomy knowledge from their first year to third year. Similarly, students in obstetrics and gynecology rotations demonstrated a 40.4% decrease in overall anatomy retention from their first to third year (Jurjus et al., 2014). Narnaware and Neumeier (2019) reported that second-year nursing students demonstrated a 28.7% decline in anatomy knowledge over the course of one year. Dayal et al. (2017) noted attrition of anatomy knowledge when comparing fourth year physiotherapy students to first year physiotherapy students who had just completed the program's anatomy course. Prince et al. (2005) reported 26% to 64% of fourth year medical students failed case-based anatomy tests, depending on each test's standards. Hall and Durward (2009) suggested that time lapsed from learning content to testing of knowledge contributed to various retention of anatomy knowledge among radiography students. Due to the time elapsed since last anatomy course, occupational therapy students may also experience a decrease in retention of anatomy knowledge which may impact their ability to apply anatomy knowledge in their occupational therapy program and as a practitioner.

Smith and Mathias (2011) indicated that 54.6% of graduating medical students reported they felt they forgot a large amount of anatomy knowledge. However, acquisition and retention of anatomy knowledge may improve when knowledge is related to the context of clinical practice (Bergman et al., 2011; Bergman et al., 2013; Bergman et al., 2015; Fincher et al., 2009; Grosser et al., 2019; Lazarus et al., 2012; Norman, 2007; Smith & Mathias, 2010; Smith & Mathias, 2011; Waseem et al., 2018). Prior to starting an occupational therapy program, students likely do not fully understand how anatomy knowledge is related to clinical occupational therapy practice. Thus, occupational therapy students may experience a decrease in retention of anatomy knowledge from prerequisite courses to graduate program matriculation.

The results of this study did not find a correlation between number of semesters of anatomy and academic performance in the Analysis of Human Movement course. Similarly, Robertson et al. (2019) reported no statistically significant relationships between number of prior anatomy courses and final course grade among medical and dental students. Kondrashov et al. (2017) found that students who had taken anatomy prior to medical school matriculation compared to those who did not had no statistically significant differences between medical school gross anatomy course grade and medical school grade point average. However, when comparing grades solely among students with anatomy coursework prior to program matriculation, students who took at least three semesters of anatomy, including a semester involving human cadavers, had higher gross anatomy course grades (Kondrashov et al., 2017). Students who experience several semesters of anatomy are receiving repetitive exposure to anatomy material. Retention of anatomy knowledge may improve with repeated exposure to material (Feigin et al., 2007; Kooloos et al., 2020; Robertson et al., 2019). Thus, students who complete several semesters of anatomy may have improved anatomy knowledge retention, which may improve performance in graduate level anatomy

coursework. However, further research is warranted to understand the impact of the number of semesters of anatomy completed prior to graduate program matriculation, has on academic performance within an occupational therapy graduate program.

After an exhaustive review of the literature, no studies were identified that examined perceived preparedness of occupational therapy students regarding anatomical knowledge. However, in literature involving medical students, perceived preparedness was identified. Lazarus et al. (2012) indicated that medical school students reported low perceived preparedness for applying anatomy at the start of clinical practice rotations. Similarly, Bhangu et al. (2010) reported that less than a quarter of medical school students identified feeling confident in their knowledge of anatomy upon graduation. Additionally, clinical educators provided low ratings for students' ability to apply anatomy in clinical settings (Lazarus et al., 2012). On the contrary, Smith and Mathias (2011) found that upon graduation, 77% of medical students felt they had enough anatomical knowledge for safe and competent practice. However, the same students also reported that they felt there remained a substantial amount of anatomy that they did not know (Smith & Mathias, 2011).

The results of this study did not find any correlations between academic performance and another other variable. However, this may be interpreted with caution as the researchers did not have access to grade percentages from the Analysis of Human Movement course and self-report bias may have occurred. The Analysis of Human Movement course also includes material beyond anatomy concepts as it addresses principles of kinesiology and biomechanics. Therefore, grades in the course may not be solely reflective of anatomy knowledge. Additionally, undergraduate or preadmission grade point averages were not explored. Undergraduate grade point average (GPA) has commonly been used as an indicator for academic performance and success among occupational therapy and other health professional students (Bathje et al., 2014; Huhn & Parrott, 2017; Novalis et al., 2017; Lysaght et al., 2009; Jones et al., 2014; Salvatori, 2001). However, undergraduate GPA is not necessarily predictive of clinical success among occupational therapy students. Several studies indicated that undergraduate or preadmission cumulative grade point averages did not predict students' clinical performance in fieldwork rotations (Bathje et al., 2014; Kirchner et al., 2001; Whisner et al., 2019), though grades in a MOT gross anatomy course were predictive of students' evaluation skills during fieldwork (Whisner et al., 2019). Further research is suggested to determine if a standalone anatomy course within an occupational therapy program is necessary and beneficial in preparing students for clinical success.

The results of our study indicated that regardless of anatomy background, perceived preparedness, or academic performance, a majority of students indicated that they would have benefited from and participated in a standalone anatomy review course. These student perspectives align with the perspectives of occupational therapy practitioners. The findings of a pilot survey study revealed that 94% of occupational therapy practitioner participants believed that anatomy should be a standalone course and integrated within occupational therapy curricula (Schofield, 2013). A national survey revealed that 54% of occupational therapist participants believed anatomy should be a

standalone course within occupational therapy curricula (Schofield, 2017). It appears that students and practitioners believe that a standalone anatomy course is beneficial in occupational therapy curricula. However, the actual and perceived benefits of standalone anatomy courses within occupational therapy curricula have not been explored in the literature.

Limitations

Limitations of this study include a relatively small sample size of participants who were recruited from a single university that does not offer anatomy as a standalone course. As a result, the generalizability of the study's findings is limited. Though similarities exist between the MOT and OTD Analysis of Human Movement courses, the OTD standards differ from the MOT standards and the material in each course is presented by different instructors which may result in variability between the courses. This leaves the question responses regarding perceptions of preparedness for the course variable as well. Another limitation was that specific academic percentage grades from the Analysis of Human Movement courses were not available to the researchers. There is the potential for participants to inaccurately recall their grade by over or underestimation. The decrease in variance of grades may have occurred due to self-report bias.

Future Research

The results of this study are preliminary and future research is warranted to further explore and better understand the relationship between prerequisite anatomy coursework and academic and clinical performance among occupational therapy students. Future research should include a larger sample size of participants from multiple institutions including those with a standalone anatomy course in their curriculum. Specific academic performance grades should also be collected in order to better understand academic success and perceptions of readiness for fieldwork placements.

Future research may also include investigation of retention of anatomy knowledge prior to entering fieldwork, at the end of an occupational therapy program prior to taking the NBCOT examination, and then following entry into the workforce. Additional research may also be beneficial regarding what knowledge is required for safe and competent clinical practice in a variety of traditional settings and as well as emerging practice areas. This information would be valuable in determining if there is a need for a reassessment of occupational therapy curricula to ensure students are provided with the knowledge required for safe and competent clinical practice.

Implications for Occupational Therapy Education

The variables that influence students' anatomy backgrounds and experiences suggest that a standalone anatomy course within programs, or additional student resources to support anatomical knowledge may be beneficial for incoming occupational therapy students. However, many challenges may arise when implementing an anatomy course into a curriculum (Schofield, 2017). Some of these challenges include: financial costs (including cost of faculty, space, and materials), lack of available time or inability to increase credit load within an established curriculum, availability of cadaver

specimen(s), and lack of available and qualified faculty members to teach the course (Drake et al., 2009; Gabard et al., 2012; Hildebrandt, 2010; Mathiowetz et al., 2015; McLachlan et al., 2004; McLachlan & Patten, 2006; Narnaware & Neumeier, 2019; Schofield, 2017; Thomas et al., 2011; Wilson et al., 2019). These barriers may deter universities from implementing a standalone anatomy course within occupational therapy curricula, however other options exist.

A potential solution to overcoming these barriers is the implementation of a standalone anatomy review course. One option could be an online format that is offered prior to occupational therapy program matriculation or within the first semester of occupational therapy programs. This course would serve as a “refresher” course for students to help prepare all students by providing the same information prior to or at the start of their occupational therapy program. An online pedagogical method and environment can be flexible, easily accessible, cost and time effective, allows students to go at their own pace, and allows students to return to the course content as many times as needed (Barillas, 2019; Karp & Gallagher, 2019; Losco et al., 2017; McAlister, 2014; Singh & Min, 2017; White et al., 2018; Yammine & Violato, 2014). Thus, an online course may be a viable solution to implementing a standalone anatomy course into occupational therapy curricula.

Conclusion

Knowledge of human anatomy aids occupational therapists in understanding the impact of dysfunction, limitations on occupational performance and supports safe and competent clinical practice. Data analysis revealed that regardless of prior anatomy coursework, perceived preparedness, and academic performance almost all participants were in favor of a standalone anatomy review course. Occupational therapy programs may consider additional resources such as a standalone anatomy course to ensure that students are receiving the education and resources necessary to foster academic success and prepare them for fieldwork experiences as well as entry-level clinical practice.

References

- Accreditation Council for Occupational Therapy Education. (2018). *2018 Accreditation council for occupational therapy education (ACOTE®) standards and interpretive guide (effective July 31, 2020)*.
<https://www.aota.org/~media/Corporate/Files/EducationCareers/Accredit/StandardsReview/2018-ACOTE-Standards-Interpretive-Guide.pdf>
- Adam, K., Strong, J., & Chipchase, L. (2014). Foundations for work-related practice: Occupational therapy and physiotherapy entry-level curricula. *International Journal of Therapy and Rehabilitation*, 20(2), 91-100.
<https://doi.org/10.12968/ijtr.2013.20.2.91>
- American Occupational Therapy Association. (n.d.a.). *History of AOTA accreditation*. Retrieved from <https://www.aota.org/Education-Careers/Accreditation/Overview/History.aspx>

- American Occupational Therapy Association. (n.d.b.). *ACOTE mission & vision statements*. Retrieved from <https://www.aota.org/Education-Careers/Accreditation/Overview/Mission.aspx>
- American Occupational Therapy Association. (n.d.c.). *Common occupational therapy program formats & admissions criteria*. <https://www.aota.org/Education-Careers/Considering-OT-Career/Resources/Sample-Admissions-Criteria.aspx>
- American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy*, 68(Suppl. 1), S1-S48. <https://doi.org/10.5014/ajot.2014.682006>
- Bains, M., & Kaliski, D. Z. (2020). An anatomy workshop for improving anatomy self-efficacy and competency when transitioning into a problem-based learning, Doctor of Physical Therapy program. *Advanced Physiology Education*, 44(1), 39-49. <https://doi.org/10.1152/advan.00048.2019>
- Barillas, R. B. (2019). The effect of 3D human anatomy software on online students' academic performance. *Journal of Occupational Therapy Education*, 3(2), 1-14. <https://doi.org/10.26681/jote.2019.030202>
- Bathje, M., Ozelie, R., & Deavila, E. (2014). The relationship between admission criteria and fieldwork performance in a masters-level OT program: Implications for admissions. *Open Journal of Occupational Therapy*, 2(3), 1-14. <https://doi.org/10.15453/2168-6408.1110>
- Bergman, E. M., Van Der Vleuten, C. P. M., & Scherpbier, A. J. J. A. (2011). Why don't they know enough about anatomy? A narrative review. *Medical Teacher*, 33(5), 403-409. <https://doi.org/10.3109/0142159X.2010.536276>
- Bergman, E. M., Verheijen, I. W. H., Scherpbier, A. J. J. A., Van Der Vleuten, C. P. M., & De Bruin, A. B. H. (2013). Influences on anatomical knowledge: The complete argument. *Clinical Anatomy*, 27(3), 296-303. <https://doi.org/10.1002/ca.22341>
- Bergman, E. M., De Bruin, A. B. H., Vorstenbosch, M. A. T. M., Kooloos, J. G. M., Puts, G. C. W. M., Leppink, J., Scherpbier, A. J. J. A., & Van Der Vleuten, C. P. M. (2015). Effects of learning content in context on knowledge acquisition and recall: A pretest-posttest control group design. *BMC Medical Education*, 15(133), 1-11. <https://doi.org/10.1186/s12909-015-0416-0>
- Bhangu, A., Boutefnouchet, T., Yong, X., Abrahams, P., & Joplin, R. (2010). A three-year prospective longitudinal cohort study of medical students' attitudes toward anatomy teaching and their career aspirations. *Anatomical Sciences Education*, 3(4), 184-190. <https://doi.org/10.1002/ase.165>
- Carroll, M. A., & Lawson, K. (2014). The intermingled history of occupational therapy and anatomical education: A retrospective exploration. *Anatomical Sciences Education*, 7(6), 494-500. <https://doi.org/10.1002/ase.1451>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd ed.). Lawrence Erlbaum Associates.
- Custers, E. J. F. M. (2010). Long-term retention of basic science knowledge: A review study. *Advances in Health Sciences Education*, 15(1), 109-128. <https://doi.org/10.1007/s10459-008-9101-y>

- Dayal, M. R., Owens, J., Gibson, W., & Štrkalj, G. (2017). Anatomical knowledge retention in physiotherapy students: A preliminary assessment. *International Journal of Anatomy and Research*, 5(1), 3474-3479. <https://doi.org/10.16965/ijar.2016.485>
- Díaz-Mancha, J. -A., Castillo-López, J. M., Munuera-Martinez, P. V., Fernández-Seguín, L. M., Polo-Padillo, J., & Heredia-Rizo, A. M. (2016). A comparison of fourth-year health sciences students' knowledge of gross lower and upper limb anatomy. A cross-sectional study. *Journal of Manipulative and Physiological Therapeutics*, 39(6), 450-457. <https://doi.org/10.1016/j.jmpt.2016.05.007>
- Doomernik, D. E., van Goor, H., Kooloos, J. G. M., & ten Broek, R. P. (2016). Longitudinal retention of anatomical knowledge in second-year medical students. *Anatomical Sciences Education*, 10(3), 242-248. <https://doi.org/10.1002/ase.1656>
- Drake, R. L., McBride, J. M., Lachman, N., & Pawlina, W. (2009). Medical education in the anatomical sciences: The winds of change continue to blow. *Anatomical Sciences Education*, 2(6), 253-259. <https://doi.org/10.1002/ase.117>
- Ellis, H. (2002). Medico-legal litigation and its links with surgical anatomy. *Surgery (Oxford)*, 20(8), i-ii. <https://doi.org/10.1383/surg.20.8.0.14518>
- Estai, M., & Bunt, S. (2016). Best teaching practices in anatomy education: A critical review. *Annals of Anatomy*, 208, 151-157. <https://doi.org/10.1016/j.aanat.2016.02.010>
- Feigin, D. S., Magid, D., Smirniotopoulos, J. G., & Carbognin, S. J. (2007). Learning and retaining normal radiographic chest anatomy: Does preclinical exposure improve student performance? *Academic Radiology*, 14(9), 1137-1142. <https://doi.org/10.1016/j.acra.2007.06.023>
- Fincher, R.-M. E., Wallach, P. M., & Richardson, W. S. (2009). Basic science right, not basic science lite: Medical education at a crossroad. *Journal of General Internal Medicine*, 24(11), 1255-1258. <https://doi.org/10.1007/s11606-009-1109-3>
- Gabard, D. L., Lowe, D. L., & Chang, J. W. (2012). Current and future instructional methods and influencing factors in anatomy instruction in physical therapy and medical schools in the U.S. *Journal of Allied Health*, 41(2), 53-62.
- Grosser, J., Bientzle, M., Shiozawa, T., Hirt, B., & Kimmerle, J. (2019). Acquiring clinical knowledge from an online video platform: A randomized controlled experiment on the relevance of integrating anatomical information and clinical practice. *Anatomical Sciences Education*, 12(5), 478-484. <https://doi.org/10.1002/ase.1841>
- Hall, A. S., & Durward, B. R. (2009). Retention of anatomy knowledge by student radiographers. *Radiography*, 15(3), 22-28. <https://doi.org/10.1016/j.radi.2009.03.002>
- Hildebrandt, S. (2010). Lessons to be learned from the history of anatomical teaching in the United States: The example of the University of Michigan. *Anatomical Sciences Education*, 3(4), 202-212. <https://doi.org/10.1002/ase.166>
- Huhn, K., & Parrott, S. J. (2017). Exploration of relationships among the health sciences reasoning test, the national physical therapy licensing examination, and cognitive admission variables. *Journal of Physical Therapy Education*, 31(1), 7-13. <https://doi.org/10.1097/00001416-201731010-00004>

- Jones, P. E., Simpkins, S., & Hocking, J. A. (2014). Imperfect physician assistant and physical therapist admissions processes in the United States. *Journal of Educational Evaluation for Health Professions*, 11, 11. <https://doi.org/10.3352/jeehp.11.11>
- Jurjus, R. A., Lee, J., Ahle, S., Brown, K. M., Butera, G., Goldman, E. F., & Krapf, J. M. (2014). Anatomical knowledge retention in third-year medical students prior to obstetrics and gynecology and surgery rotations. *Anatomical Sciences Education*, 7(6), 461-468. <https://doi.org/10.1002/ase.1441>
- Karp, P., & Gallagher, R. G. (2019). Student perceptions and grade comparisons after exposure to instructor-made skills videos in a kinesiology course. *Journal of Occupational Therapy Education*, 3(3), 1-16. <https://doi.org/10.26681/jote.2019.030307>
- Kirchner, G. L., Stone, R. G., & Holm, M. B. (2001). Use of admission criteria to predict performance of students in an entry-level master's program on fieldwork placements and in academic courses. *Occupational Therapy in Health Care*, 13(1), 1-10. https://doi.org/10.1080/J003v13n01_01
- Kooloos, J. G. M., Bergman, E. M., Scheffers, M. A. G. P., Schepens-Franke, A. N., & Vorstenbosch, M. A. T. M. (2020). The effect of passive and active education methods applied in repetition activities on the retention of anatomical knowledge. *Anatomical Sciences Education*, 13(4), 458-466. <https://doi.org/10.1002/ase.1924>
- Kondrashov, P., McDaniel, D. J., & Jordan, R. M. (2017). Premedical anatomy experience and student performance in medical gross anatomy. *Clinical Anatomy*, 30(3), 303-311. <https://doi.org/10.1002/ca.22846>
- Latman, N. S., & Lanier, R. (2001). Gross anatomy course content and teaching methodology in allied health: Clinicians' experiences and recommendations. *Clinical Anatomy*, 14(2), 152-157. [https://doi.org/10.1002/1098-2353\(200103\)14:2%3C152::aid-ca1024%3E3.0.co;2-a](https://doi.org/10.1002/1098-2353(200103)14:2%3C152::aid-ca1024%3E3.0.co;2-a)
- Lazarus, M. D., Chinchilli, V. M., Leong, S. L., & Kauffman, G. L. Jr. (2012). Perceptions of anatomy: Critical components in the clinical setting. *Anatomical Sciences Education*, 5(4), 187-199. <https://doi.org/10.1002/ase.1281>
- Losco, C. D., Grant, W. D., Armson, A., Meyer, A. J., & Walker, B. F. (2017). Effective methods of teaching and learning in anatomy as a basic science: A BEME systematic review: BEME guide no. 44. *Medical Teacher* 39(3), 234-243. <https://doi.org/10.1080/0142159X.2016.1271944>
- Lysaght, R., Donnelly, C., & Villeneuve, M. (2009). Factors predicting applicant outcomes in occupational therapy education. *Canadian Journal of Occupational Therapy*, 76(1), 38-47. <https://doi.org/10.1177/000841740907600110>
- Mathiowetz, V., Yu, C. -H., & Quake-Repp, C. (2015). Comparison of a gross anatomy laboratory to online anatomy software for teaching anatomy. *Anatomical Sciences Education*, 9(1), 52-59. <https://doi.org/10.1002/ase.1528>
- McAlister, R. B. (2014). Use of instructor-produced YouTube® videos to supplement manual skills training in occupational therapy education. *American Journal of Occupational Therapy*, 69(Supplement 2), S67-S72. <https://doi.org/10.5014/ajot.2014.685s04>

- McLachlan, J. C., Bligh, J., Bradley, P., & Searle, J. (2004). Teaching anatomy without cadavers. *Medical Education*, 38(4), 418-424.
<https://doi.org/10.1046/j.1365-2923.2004.07195.x>
- McLachlan, J. C., & Patten, D. (2006). Anatomy teaching: Ghosts of the past, present, and future. *Medical Education*, 40(3), 243-253.
<https://doi.org/10.1111/j.1365-2929.2006.02401.x>
- Moxham, B. J., Plaisant, O., Smith, C. F., Pawlina, W., & McHanwell, S. (2014). An approach toward the development of core syllabuses for the anatomical sciences. *Anatomical Sciences Education*, 7(4), 302-311.
<https://doi.org/10.1002/ase.1456>
- Narnaware, Y. R., & Neumeier, M. (2019). Second-year nursing students' retention of gross anatomical knowledge. *Anatomical Sciences Education*, 13(2), 230-236.
<https://doi.org/10.1002/ase.1906>
- Norman, G. (2007). How basic is basic science? *Advances in Health Sciences Education*, 12, 401-403. <https://doi.org/10.1007/s10459-007-9077-z>
- Novalis, S. D., Cyranowski, J. M., & Dolhi, C. D. (2017). Passing the NBCOT examination: Preadmission, academic, and fieldwork factors. *The Open Journal of Occupational Therapy*, 5(4), Article 9. <http://doi.org/10.15453/2168-6408.1341>
- Parmar, S. K., & Rathinam, B. A. D. (2011). Introduction of vertical integration and case-based learning in anatomy for undergraduate physical therapy and occupational therapy students. *Anatomical Sciences Education*, 4(3), 170-173.
<https://doi.org/10.1002/ase.225>
- Prince, K. J. A. H., Scherpbier, A. J. A. A., Van Mameren, H., Drukker, J., & Van Der Vleuten, C. P. M. (2005). Do students have sufficient knowledge of clinical anatomy? *Medical education*, 39(3), 326-332.
<https://doi.org/10.1111/j.1365-2929.2005.02096.x>
- Robertson, E. M., Thompson, K. L., & Notebaert, A. J. (2019). Perceived benefits of anatomy coursework prior to medical and dental school. *Anatomical Sciences Education*, 13(2), 168-181. <https://doi.org/10.1002/ase.1882>
- Salvatori, P. (2001). Reliability and validity of admissions tools used to select students for health professions. *Advances in Health Sciences Education*, 6(2), 159-175.
<https://doi.org/10.1023/a:1011489618208>
- Schofield, K. A. (2013). Anatomy in occupational therapy program curriculum: Practitioners perspectives. *Anatomical sciences education*, 7(2), 97-106.
<https://doi.org/10.1002/ase.1378>
- Schofield, K. A. (2017). Anatomy education in occupational therapy curricula: Perspectives of practitioners in the United States. *Anatomical Sciences Education*, 11(3), 243-253. <https://doi.org/10.1002/ase.1723>
- Singh, A., & Min, A. K. K. (2017). Digital lectures for learning gross anatomy: A study of their efficacy. *Korean Journal of Medical Education*, 29(1), 27-32.
<https://doi.org/10.3946%2Fkjme.2017.50>
- Smith, C. F., & Mathias, H. S. (2010). Medical students' approaches to learning anatomy: Students' experiences and relations to the learning environment. *Clinical Anatomy*, 23(1), 106-114. <https://doi.org/10.1002/ca.20900>

- Smith, C. F., & Mathias, H. S. (2011). What impact does anatomy education have on clinical practice? *Clinical Anatomy*, 24(1), 113-119. <https://doi.org/10.1002/ca.21065>
- Sparacino, A. M., Gonzalez, V. H., Ball, S., Cielocha, J. J., Helm, K., & McLeod, D. S. (2018). A quantitative analysis for four undergraduate human anatomy laboratory curricula: Approaches, identified structures, concepts, and thematic emphases. *Medical Science Educator*, 29(2), 101-111. <https://doi.org/10.1007/s40670-018-00639-4>
- Stabile, I. (2015). Designing courses in anatomy. *European Journal of Anatomy*, 19(1), 87-104. <http://eurjanat.com/data/pdf/eja.140305is.pdf>
- Sugand, K., Abrahams, P., & Khurana, A. (2010). The anatomy of anatomy: A review of its modernization. *Anatomical Sciences Education*, 3(2), 83-93. <https://doi.org/10.1002/ase.139>
- Thomas, K. J., Denham, B. E., & Dinolfo, J. D. (2011). Perceptions among occupational and physical therapy students of a nontraditional methodology for teaching laboratory gross anatomy. *Anatomical Sciences Education*, 4(2), 71-77. <https://doi.org/10.1002/ase.208>
- Turney, B. W. (2007). Anatomy in modern medical curriculum. *Annals of the Royal College of Surgeons of England*, 89(2), 104-107. <https://doi.org/10.1308%2F003588407X168244>
- Waseem, N., Eraky, M. A., & Iqbal, K. (2018). Why do medical students forget anatomy later on? A qualitative study. *Journal of Pakistan Medical Association*, 68(8), 1228-1232.
- White, L. J., McGowan, H. W., & McDonald, A. C. (2018). The effect of content delivery style on student performance in anatomy. *Anatomical Sciences Education*, 12(1), 43-51. <http://doi.org/10.1002/ase.1787>
- Whisner, S. M., Geddie, M., Sechrist, D., & Wang, E. (2019). Examination of potential factors to predict fieldwork experience. *Journal of Occupational Therapy Education*, 3(1), 1-22. <https://doi.org/10.26681/jote.2019.030106>
- Wilson, A. B., Notebaert, A. J., Schaefer, A. F., Moxham, B. J., Stephens, S., Mueller, C., Lazarus, M. D., Katrikh, A. Z., & Brooks, W. S. (2019). A look at the anatomy educator job market: Anatomists remain in short supply. *Anatomical Sciences Education*, 13(1), 91-101. <https://doi.org/10.1002/ase.1895>
- Wilhelmsson, N., Dahlgren, L. O., Hult, H., Scheja, M., Lonka, K., & Josephson, A. (2009). The anatomy of learning anatomy. *Advances in Health Science Education*, 15(2), 153-165. <https://doi.org/10.1007/s10459-009-9171-5>
- Yamine, K. (2014). The current status of anatomy knowledge: Where are we now? Where do we need to go and how do we get there? *Teaching and Learning in Medicine*, 26(2), 184-188. <https://doi.org/10.1080/10401334.2014.883985>
- Yamine, K., & Violato, C. (2014). A meta-analysis of the educational effectiveness of three-dimensional visualization technologies in teaching anatomy. *Anatomical Sciences Education*, 8(6), 525-538. <https://doi.org/10.1002/ase.1510>
- Zumwalt, A. C., Lufler, R. S., Monteiro, J., & Shaffer, K. (2010). Building the body: Active learning laboratories that emphasize practical aspects of anatomy and integration with radiology. *Anatomical Sciences Education*, 3(3), 123-140. <https://doi.org/10.1002/ase.153>

Appendix

MOT and OTD Alumni and Student Survey

1. What is your age? (If you prefer not to answer please indicate N/A in the space below).
2. What is your gender
 - a. Female
 - b. Male
 - c. Other
 - d. I prefer not to answer
3. What was your undergraduate major? (Examples: Exercise and Wellness, Biology, Psychology, etc.) (If you prefer not to answer please indicate N/A in the space below)
4. In what state did you take your prerequisite anatomy course? (If you prefer not to answer please indicate N/A in the space below)
5. Did you take anatomy _____?
 - a. As a requirement for your undergraduate degree
 - b. During your undergraduate degree (NOT required for graduation) as a graduate school prerequisite
 - c. As a post graduate course for a graduate school prerequisite
 - d. I prefer not to answer
6. At the start of your first semester of XX University's MOT or OTD program, when did you take your last anatomy course?
 - a. 1-3 months prior to starting
 - b. 4-6 months prior to starting
 - c. 7-12 months prior to starting
 - d. 1-2 years prior to starting
 - e. 3-4 years prior to starting
 - f. 5+ years prior to starting
 - g. I prefer not to answer
7. How many semesters of anatomy courses did you take prior to your first semester in the MOT or OTD program? (This includes but is not limited to any anatomy & physiology courses, introductory anatomy, gross anatomy, dissection anatomy, musculoskeletal anatomy, etc.).
 - a. 1 semester
 - b. 2 semesters
 - c. 3 semesters
 - d. 4 semesters

- e. 5 semesters
 - f. 6 or more semesters
 - g. I prefer not to answer
8. Were anatomy courses offered separate from physiology courses at your university?
- a. Yes
 - b. No
 - c. Other, please specify below
 - d. I prefer not to answer
9. What type of anatomy lab(s) did you have? (Please select all that apply)
- a. Human cadaver lab
 - b. Dissection lab
 - c. Models
 - d. Lecture only, no lab component
 - e. Anatomy and physiology combined lab
 - f. Computer generated/web-based
 - g. Other, please specify below
 - h. I prefer not to answer
10. Please rate how prepared you felt for the anatomy-related content that was presented in Analysis of Human Movement (MOT program) or Analysis of Human Movement (OTD program).
- a. 1 – Not prepared
 - b. 2 – Somewhat prepared
 - c. 3 – Prepared
 - d. 4 – Very prepared
 - e. 5 – Extremely prepared
 - f. I prefer not to answer
11. Which of the following bests represents your final grade in Analysis of Human Movement? (Please only answer if you were/are part of the OTD program)
- a. A: 90-100
 - b. B: 80-89
 - c. C: 75-79
 - d. I prefer not to answer
12. Which of the following bests represents your final grade in Analysis of Human Movement? (Please only answer if you were part of the MOT program)
- a. A: 90-100
 - b. B: 80-89
 - c. C: 75-79
 - d. I prefer not to answer

13. Please select all of the following that would have been beneficial to review PRIOR to taking Analysis of Human Movement (MOT program) or Analysis of Human Movement (OTD program).
- a. Bones
 - b. Muscle actions
 - c. Muscle origins and insertions
 - d. Synovial joints (ex. Ball and socket, saddle, hinge, pivot)
 - e. Skeletal muscle shapes (ex. Fusiform, unipennate, parallel etc.)
 - f. Other, please specify below
 - g. I prefer not to answer
14. Would you have benefited from and participated in an online general anatomy review course during the first semester of the MOT or OTD program?
- a. Yes
 - b. No
 - c. I prefer not to answer